

CLAIMS

WHAT IS CLAIMED IS:

Claim 1: A method for screening a material, the method comprising:

5 providing a supporting member containing at least one piezoelectric element having an electrode;

securing a material sample onto the piezoelectric element wherein the sample is selected from a group consisting of solids, semi-solids, high viscosity fluids, and a combination thereof;

10 directing a force from the piezoelectric element to the sample by applying a voltage to the piezoelectric element through the electrode; and

monitoring a response of the sample to the force with at least one response sensing device, wherein the response of the sample is indicative of a mechanical property.

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Claim 2: The method of claim 1, wherein the sample has a thickness of less than about 500 microns.

20 Claim 3: The method of claim 1, wherein the sample is secured on the piezoelectric element by means selected from a group consisting of mechanically, magnetically, electromagnetically, electromechanically, chemically, and a combination thereof.

25 Claim 4: The method of claim 1, wherein the at least one response sensing device is selected from a group consisting of an optical response sensing device selected from a group consisting of optical reflectance, optical interferometry, shadow illumination, and a combination thereof; a piezoelectric sensing device comprising of the electrode and a sensor region, and a combination thereof.

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Claim 5: The method of claim 1, wherein the piezoelectric element is a bender.

Claim 6: The method of claim 5, further comprising securing the electrode to a backing plate, wherein the bender comprises the backing plate and an appropriately polarized ceramic disk attached to the backing plate.

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Claim 7: The method of claim 6, wherein securing the electrode to the backing plate is by means selected from a group consisting of sintering, gluing, fastening, and a combination thereof.

10 Claim 8: The method of claim 6, wherein the sample is secured to the backing plate.

15 Claim 9: The method of claim 1, wherein the piezoelectric element further includes a sensor region and an actuator region that are separate structures connected to each other by a platform.

Claim 10: A method for screening a material for a mechanical properties, the method comprising:

20 providing a supporting member containing at least one piezoelectric element having an electrode;

directing a force from the piezoelectric element by applying a voltage selected from a group consisting of oscillatory, non-oscillatory, and a combination thereof to the piezoelectric element;

25 monitoring a response of the piezoelectric element to the force with at least one response sensing device selected from a group consisting of an optical response sensing device selected from a group consisting of optical reflectance, optical interferometry, shadow illumination, and a combination thereof; a piezoelectric sensing device comprising of the electrode and a sensor region, and a combination thereof;

30 securing a material sample onto the piezoelectric element by means selected from a group consisting of mechanically, magnetically, electromagnetically, electromechanically, chemically, and a combination

thereof, wherein the sample is selected from a group consisting of solids, semi-solids, high viscosity fluids, and a combination thereof, has an area of less than about 50 mm² and a thickness of less than about 500 microns;

5 directing a force from the piezoelectric element to the sample by applying the voltage to the piezoelectric element; and

monitoring a response of the sample to the force with the at least one response sensing device, wherein the mechanical properties being screened are selected from a group consisting of flexure, uniaxial extension, biaxial compression, shear, stress and strain at failure, toughness, Young's modulus, 10 complex modulus, and a combination thereof.

Claim 11: The method of claim 10, further comprising regulating environmental conditions of the sample.

15 Claim 12: The method of claim 10, wherein the piezoelectric element is a bender.

Claim 13: The method of Claim 12, wherein the bender comprises a backing plate and an appropriately polarized ceramic disk attached to the backing 20 plate, wherein the electrode is secured to the backing plate, and the sample is secured to the backing plate.

Claim 14: The method of claim 10, wherein the piezoelectric element further includes a sensor region and a actuator region that are separate structures 25 connected to each other by a platform.